Tropical Agricultural Research (2022) 33(4): 386-395

Contents available at: Sri Lanka Journals Online

Tropical Agricultural Research

Journal Home Page: https://tar.sljol.info

Assessment of Knowledge and Practices regarding Iron Deficiency Anaemia among Pregnant Women in Kattankudy D.S. Division of Batticaloa District, Sri Lanka

M.R. Roshana[1*] and T. Mahendran[2]

[1]*Department of Biosystems Technology, Faculty of Technology, Eastern University, Sri Lanka*
[2]*Department of Agricultural Chemistry, Faculty of Agriculture, Eastern University, Sri Lanka*

ARTICLE INFO

Article history:
Received: 25 June 2021
Revised version received: 11 October 2021
Accepted: 16 August 2022
Available online: 01 October 2022

Keywords:
Anaemia
Iron deficiency
Knowledge
Practices
Pregnant women

Citation:
Roshana, M. R. and Mahendran, T. (2022). Assessment of Knowledge and Practices regarding Iron Deficiency Anaemia among Pregnant Women in Kattankudy D.S. Division of Batticaloa District, Sri Lanka. Tropical Agricultural Research, 33(4): 386-395.

DOI:
http://doi.org/10.4038/tar.v33i4.8589

Roshana, M. R.
https://orcid.org/0000-0002-8634-6699

ABSTRACT

The purpose of this study was to evaluate the knowledge and practices regarding anaemia among pregnant women in the Kattankudy D.S. division of Batticaloa district, Sri Lanka. A total of 352 pregnant women were enrolled on the study using a non-random sampling method. A semi-structured interview schedule was used to collect data. The descriptive analysis was used to study the sociodemographic and baseline data of the participants. Friedman's test was used to determine the relationship between study variables. Baseline data indicated that 59.9% of the women were multigravida, and the majority of the pregnant women had pregnancy spacing for more than three years. The haemoglobin (Hb) level of the women showed that the majority of them (80.1%) had ≥11 g d/L (normal), and only 19.9% of them had <11 g d/L (anaemic). Most of the women i.e., 226 (64.2 %), knew pregnancy as the cause of anaemia, and the majority of respondents were unaware of the causes of anaemia like repeated pregnancy at a short interval i.e., <2 years (210 i.e., 59.7%), poor dietary habits (183 i.e., 52.0%), hookworm infection (210 i.e., 59.7%) and history of heavy menstrual flow (197 i.e., 56.0%). There was a significant relationship between pregnant women's educational level and their knowledge regarding the causes of anaemia, according to the Friedman test ($\chi 2$ = 905.321, $p<0.05$). The majority of pregnant women were following good practices for the prevention of anaemia. The study indicated that pregnant women had poor knowledge of the causes of anaemia, and intervention is required to reduce the prevalence of anaemia during pregnancy.

Corresponding author-mrroshana30@gmail.com *

INTRODUCTION

Anaemia remains the most significant public health concern worldwide, with an estimated burden in poor nations. In particular, it is seen among little children, and women of reproductive age, during pregnancy and lactation. Worldwide, anaemia affects half a billion women who are of reproductive age. One of the most susceptible populations is pregnant women, owing to the high iron demand to fulfil both the needs of the mother and the fetus (Souza *et al*., 2002). Anaemia is a global public health concern that affects 32.4 million (38.2%), pregnant women, worldwide, with a high prevalence in South-East Asia (48.7%) (Tadesse *et al*., 2017).

Every year, over 510,000 maternal fatalities are reported worldwide as a result of delivery or the early postpartum period. Anaemia is responsible for around 20% of maternal mortality, with the majority of deaths occurring in underdeveloped nations (Crawley, 2004). Anaemia in pregnancy is one of the most prevalent avoidable causes of maternal morbidity and poor perinatal outcome (WHO, 2015a). According to the World Health Organization, anaemia in pregnancy is defined by a haemoglobin concentration of 11.0 g d/L in the first and third trimesters, and 10.5 g d/L in the second trimester. The volume of plasma expands during pregnancy (maximum about 32 weeks), resulting in dilution of haemoglobin. For this reason, haemoglobin levels below 10 g d/L are known to be anaemia at any point during pregnancy. Serious examination and adequate care are needed for Hb levels below 9 g d/L.

Pregnancy is associated with increased iron demand; therefore, the risk of anaemia is higher in pregnant women than in other women. While iron needs declined due to the absence of menstruation in the first trimester, they progressively raised from approximately 0.8 mg/day in the first month to about 10 mg/day during the last six weeks of pregnancy (Tay *et al*., 2013). The prevalence of anaemia worldwide and in Sri Lanka is 40.1% and 35.4% respectively (WHO, 2016). Micronutrient deficits, particularly iron deficiency (Scholl, 2005), B12 and the folic acid deficiency (Tamura and Picciano, 2006) are the source of anaemia in pregnancy.

Dietary improvements and changes in dietary habits have been severely advocated for pregnant women to improve iron absorption. It was strongly advised to eat more iron-rich meals, including iron absorption boosters such as ascorbic acid-rich foods, and avoid iron absorption blockers like tea (Nivedita and Shanthini, 2016). Iron deficiency anaemia can be minimized by consuming foods containing iron from animal products such as red meat, liver, and plant sources such as spinach, green leafy plants, drumstick leaves, beans, dates, dried fruits, and nuts available at their access.

Studies on iron deficiency anaemia (IDA) during pregnancy in Western and North Central Provinces in Sri Lanka found that the prevalence of IDA during pregnancy was 18% and 14%, respectively (Chathurani *et al*, 2012: Prathapan, 2011). However, only a very few research studies were carried out in Sri Lanka, so it is challenging to obtain a good picture of knowledge of IDA among pregnant women (Hewawaduge *et al*., 2019). The conceptual framework (Figure 1) adopted in this study explains the possible causes of anaemia and the interconnectedness of these factors in predisposing a woman to become anaemic (USAID, 2013; Osborn *et al*., 2021). It is important to investigate the knowledge and practices of iron deficiency anaemia among pregnant women. Additionally, it could be beneficial to conduct more awareness programs to prevent the effects of anaemia among pregnant women. Therefore, the current study was conducted to examine sociodemographic and baseline data, knowledge on causes of anaemia and to identify the practices related to the prevention of anaemia in pregnant women who visited antenatal clinics at the Kattankudy D.S. division.

METHODOLOGY

Study Design

The research study was undertaken at the Kattankudy D.S. division of the Batticaloa

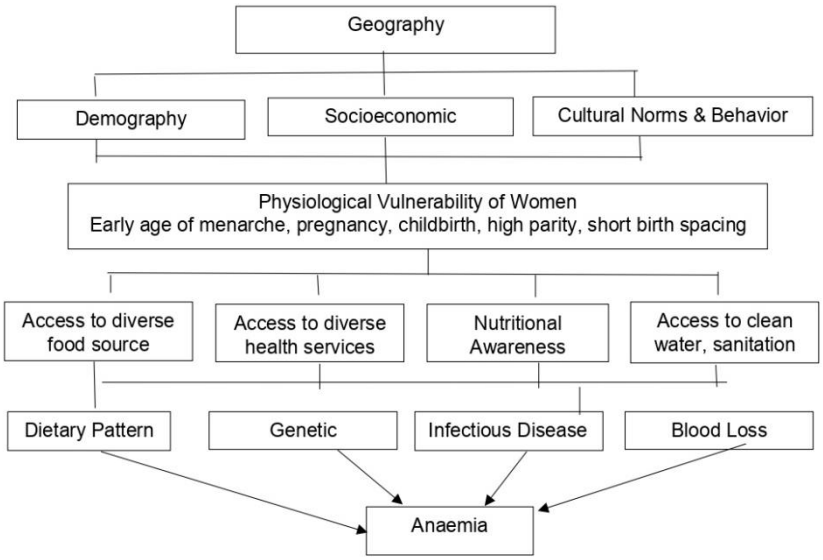

Figure 1: Conceptual framework for anaemia among reproductive-age women (USAID, 2013; Osborn *et al*., 2021)

district. The data was collected using the quantitative technique, and the pregnant women in the Kattankudy D.S. division made up the study population. A total of 352 pregnant women were enrolled using a non-random sampling method. However, only individuals who had enrolled for antenatal clinics (ANC) during the study period and those who were interested to participate and agreed to sign the consent forms were included in the study until the requisite sample size was reached in each G.S. division. Normal pregnant women in all trimesters and pregnant mothers without pregnancy complications meet the inclusion criteria. Pregnant women who were unwell due to medical conditions, unable to reply, psychologically unstable, and who repeated visits to ANC were all excluded.

Sample Size

The number of pregnant women required was calculated according to the previously described formula (Stephen *et al*., 2018). The minimum sample size required was 352 pregnant women.

$$(N = Z^2 \times P\,(1 - P) / d^2)$$

Where N is the estimated minimum sample size; Z is the confidence level at 95% (standard value is 1.96); P is the prevalence of anaemia during pregnancy 35.4% in Sri Lanka (WHO database, 2016); d is precision at 95 % confidence level = 0.05.

Data Collection

Data were collected through the administration of a semi-structured questionnaire. After examining the literature, a semi-structured survey questionnaire was developed and the questionnaire's content validity was determined by consulting with a subject matter expert and a supervisor. Before being given to the research participants, the questionnaire was pretested on 20 pregnant women from a nearby region who had comparable characteristics to the study participants to see if any changes were needed. The administrative approval was obtained from the Medical Officer of Health, Kattankudy. The Hb level of pregnant women during the first visit was accessed using their ANC record cards. Data collected from each participant averaged 30 minutes.

Each study participant gave written informed consent after reading the information on the consent form. Before giving their agreement to participate in the study, participants were given information about the research and any questions they had were resolved by offering more explanation. The consent form included sufficient information about the purpose of

the study, methodology, and affiliations with the research's institutions. Measures were taken and guaranteed that the information given was kept private and confidential.

Data Analysis

Data were transferred to SPSS version 25.0, statistical software for social science and analyzed using descriptive and inferential statistics (Friedman test) to meet the goals of the study. Frequency and percentage were used to study the sociodemographic and baseline data of the participants, knowledge regarding causes of anaemia and practices related to the prevention of anaemia.

RESULTS AND DISCUSSION

The Sociodemographic Data of Pregnant Women

There was a total of 352 pregnant women. The majority of them, 183 (52%) were between the ages of 25 and 30, while 56 (15.9%) were between the ages of 21 and 24, 43 (12.2%) were between the age group of 18-20 years followed by 42 (11.9%) in 31-35 years. The minimum amount of pregnant women i.e., 28 (8%), were in the age group above 36 years (Figure 2). The findings of the current study were in agreement with Rahel (2016). The majority of pregnancies occur in women under the age of 30 (Jaseel, 2018). Rajamouli *et al*. (2016) reported that 77.3% of pregnant women were between the ages of 20 and 29. Lokare *et al*. (2012) found that majority of the pregnant women were between the ages of 20 and 29, with an average age of 23 years.

Most of the pregnant women i.e., 133 (37.8%) had Advanced Level (A/L), 99 (28.1%) had ordinary level (O/L), 78 (22.2%) had primary education and 42 (11.9%) were graduates or above (Table 1). Illiterate pregnant women were unaware of folic acid, iron supplementation and the importance of a nutritious diet during pregnancy. Therefore, the occurrence of anaemia is high in uneducated women. Research conducted in Nepal found that 16.7% of pregnant women were illiterate, 25.8% had primary education, 56.1% had secondary education, and 16.7% had higher education (Ghimire and Pandey, 2013). Lokare *et al*. (2012) found that the lower the women's educational levels, the more likely they are to suffer from anaemia during pregnancy.

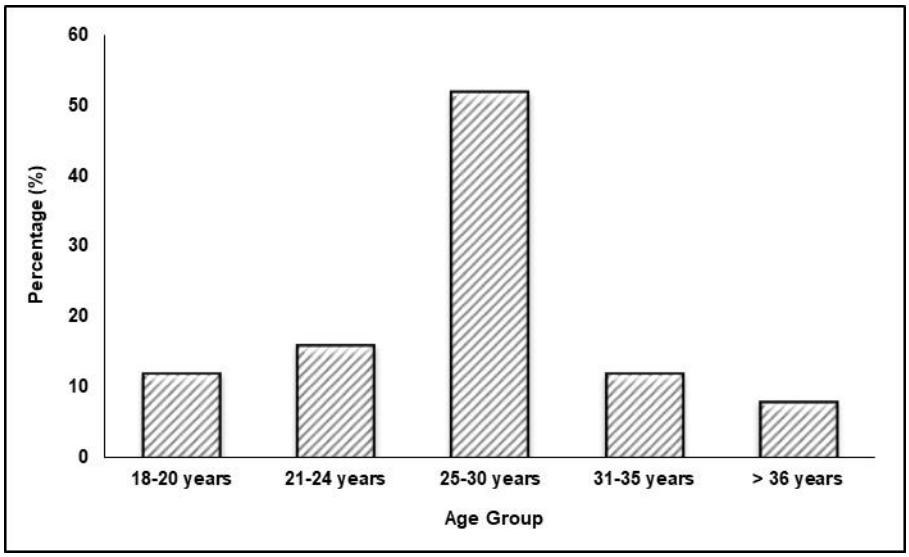

Figure 2: Age Wise Distribution of Pregnant Women

Table 1: The sociodemographic data of pregnant women

Variables	Frequency	Per cent (%)
Educational Level		
Primary education	42	11.9
Ordinary level	99	28.1
Advanced Level	133	37.8
Graduates or above	42	11.9
Type of Family		
Nuclear	212	60.2
Joint	140	39.8
Women's Occupation		
Housewife	268	76.1
Professional	84	23.9
Monthly Income		
< Rs. 10,000	57	16.2
Rs. 10,000 - 30,000	140	39.8
Rs. 30,000 - 50,000	113	32.1
> Rs. 50,000	42	11.9
Diet Pattern		
Vegetarian	282	80.1
Non-vegetarian	70	19.9

Table 1 shows the type of family of pregnant women. The majority of women had a nuclear family i.e., 212 (60.2%), and others had a joint family i.e., 140 (39.8%). This result was by the findings of Anitha (2005). One of the reasons for the disintegration of the family from joint to nuclear may be unemployment. Most rural families are shifting to urban areas for jobs. If the number of members is high in a family it is difficult to get good nutritious food as they were getting low income. It is in accordance with the findings of Gowri *et al*. (2017).

Most of the pregnant women i.e., 268 (76.1%), were housewives and others i.e., 84 (23.9%) were doing jobs (Table 1). According to a survey conducted in Karnataka, 346 (86.5%) of respondents were housewives, 16 (4.0%) were labourers, and 38 (9.5%) of respondents did other types of employment (Yadav *et al*., 2015). Rajamouli *et al.* (2016) stated that a high prevalence (96.8%) of anaemia was observed among housewives and agricultural labourers, whereas, only 3.2% of employees had anaemia. Regarding the diet pattern of pregnant women, 282 (80.1%) of them were taking a non-vegetarian diet, whereas 70 (19.9%) were taking a vegetarian diet (Table 1). Similar findings were reported by Bentely and Griffiths (2003). Inadequate nutritional requirement of pregnant women is closely related to their access to food as well as income. Yadav *et al*. (2015) found that 162 (68.0%) of respondents were non-vegetarians, while 128 (32.0%) were vegetarians.

The family income indicates that the majority, 140 (39.8%) of the family income ranged between Rs. 10,000-30,000 per month, 113 (32.1%) ranged between Rs. 30,000-50,000, 57 (16.2%) were less than Rs. 10,000 and others were above Rs. 50,000 per month (Table 1). There was an indirect relationship between family income and anaemia. It showed that the higher the family income, the better the nutrition intake, therefore, it decreased the risk of anaemia (Sinawangwulan *et al*., 2018). If the income level is not satisfied, mothers will not be able to lead a healthy lifestyle.

Baseline Data of Pregnant Women According to their Health Condition

The data presented in Table 2 reveals that 211 (59.9%) of the women were multigravida, whereas 141 (40.1%) of the women were primigravida. From the multigravida, 99 (28.1%) fall in the category number of pregnancy 2, 98 (27.8%) participants had several pregnancies 3 and

only 14 (4.0%) had several pregnancies 4 or more than 4. Yadav *et al*. (2015) found that 194 (48.5%) of the women were in their first pregnancy, 133 (33.2%) in their second pregnancy, 64 (16.0%) in their third pregnancy, and 9 (2.3%) in their fourth pregnancy. These findings were consistent with the current study.

It was also observed that birth spacing between previous pregnancies shows that 141 (40.1%) of the women had more than 3 years, 140 (39.8%) of the women had the range between 2-3 years, and 71 (20.2%) of the women had < 2 years (Table 2). Women who had fewer than two pregnancies are at a higher risk of anaemia (Jaseel, 2018). An increase in the number of pregnancies, especially those occurring at short intervals, may deplete the iron reserves of women. Al-Mehaisen *et al*. (2011) documented that anaemia is more frequent among people who were in the 2nd trimester. Many pregnant women schedule prenatal appointments in the second and third trimesters; this delay may contribute to the increasing prevalence of anaemia.

Table 2: Baseline Data of Pregnant Women

Variables		Frequency	Percentage
Number of Pregnancy	1	141	40.1
	2	99	28.1
	3	98	27.8
	≥ 4	14	4.0
Pregnancy Interval	< 2 years	71	20.2
	2-3 years	140	39.8
	≥ 3 years	141	40.1
Trimester Level	1st trimester	98	27.8
	2nd trimester	141	40.1
	3rd trimester	113	32.1
Menstrual History	3-5 days	197	56.0
	> 5 days	155	44.0
Amount of Bleeding	Heavy	70	19.9
	Scanty	282	80.1
Hb Level	≥ 11 g d/L(Normal)	282	80.1
	< 11 g d/L(Anaemia)	70	19.9
Received iron supplementation	Yes	323	91.8
	No	29	8.2

The majority, 197 (56.0%) of women had menstrual flow ranging between 3-5 days, and 155 (44.0%) of women had more than 5 days. No women were having less than 3 days (Table 2). The amount of bleeding shows that the majority, 282 (80.1%) of women had scanty periods, and 70 (19.9%) of them had heavy periods. The haemoglobin (Hb) level of women shows that the majority of 282 (80.1%) had ≥ 11 g d/L (Normal), whereas 70 (19.9%) of them had < 11 g d/L (Anaemia). According to WHO guidelines, the Hb level during pregnancy should be 11.0 g d/L in the first trimester and 10.5 g d/Lin the second trimester. Anaemia in pregnancy is classified as mild (Hb 9.0-10.9 g d/L), moderate (7.0-

8.9 g d/L) or severe (7.0 g d/L) by the WHO. Iron, folate, and vitamin B12 insufficiency are the most frequent causes of anaemia, with iron deficiency anaemia being the most common (Gwarzo and Ugwa, 2013; Masukume *et al*., 2015).

The majority of the women (323, i.e. 91.8%) took iron supplements during their current pregnancy, whereas 29 (8.2%) did not (Table 2). Iron and folate supplements are necessary during pregnancy to prevent nutritional anaemia, and iron supplementation in pregnancy is rigorously followed in underdeveloped nations and is considered a regular and routine practice for the prevention of anaemia (Osungbade and Oladunjoye, 2012). During the second and third trimesters of pregnancy, the WHO recommends taking 30-60 mg of elemental iron and 400 mcg of folic acid. (WHO, 2012).

Knowledge Regarding Causes of Anaemia

Most of the women i.e., 226 (64.2 %), knew pregnancy as the cause of anaemia. The majority of respondents were unaware of the causes of anaemia like repeated pregnancy at a short interval i.e. < 2 years (210 i.e. 59.7%), poor dietary habits (183 i.e. 52.0%), hookworm infection (210 i.e. 59.7%) and history of heavy menstrual flow (197 i.e. 56.0%). The majority of respondents had stated that they do not know the causes of anaemia like hookworm infection (113 i.e. 32.1%), repeated pregnancy at a short interval i.e. < 2 years (86 i.e. 24.4%), history of heavy menstrual flow (43 i.e. 12.2%) and pregnancy (28 i.e. 8.0%). It clearly shows that the majority of women had poor knowledge regarding the causes of anaemia in this study area.

The current study found a significant relationship ($p<0.05$) between the educational level of pregnant women and their knowledge regarding causes of anaemia according to the Friedman test ($\chi 2 = 905.321$, $p<0.05$). According to the Wilcoxon signed-rank test, there was a significant association between the causes of anaemia such as pregnancy ($Z = -15.915$, $p<0.01$), repeated pregnancy at a short interval i.e. < 2 years ($Z = -13.733$, $p<0.01$), poor dietary habit ($Z = -15.175$, $p<0.01$), hookworm infection ($Z = -13.413$, $p<0.01$) and history of heavy menstrual flow ($Z = -14.851$, $p<0.01$) with education levels of pregnant women.

Research conducted in Uganda found that pregnant women were having poor knowledge about the causes of anaemia, and they stated that the primary cause was due to the lack of education of the respondents (Mbule *et al*, 2012). Inadequate food intake and a lack of a balanced diet have been cited as the primary causes of iron deficiency anaemia by respondents. An investigation conducted in Palestine supports this finding (Kdivar *et al*, 2007). Insufficient dietary intake, poor iron bioavailability, increased requirements at specific life stages, particularly during pregnancy, rapid early childhood and adolescent growth, blood loss due to menstruation and childbirth among women, parasites, mostly hookworm, and chronic and recurrent infections such as diarrhoea, malaria, sickle-cell diseases, and anaemia are a few of the causes of anaemia in developing countries (Hurrell, 1997; Mannar, 1999; Penney and Miller, 2008).

Poor socioeconomic position, multiparity, insufficient child spacing, and maternal illnesses such as malaria, parasite, and bacterial infection are important risk factors for anaemia (Tunkyi and Moodley, 2016). Rizvi (2012) reported that as the level of education increased, awareness increased, and concluded that education had a profound impact on the level of awareness of the respondents, regarding anaemia, its causes and prevention. Ghimire and Pandey (2013) found that there was a significant association between the knowledge of anaemia and educational status.

Practices Regarding Prevention of Anaemia

Most of them in this area were following good practices regarding the prevention of anaemia. 98 (27.8%) of women checked their Hb level before pregnancy, 202 (57.4%) of women practised regular medical checkups, 102 (29.0%) of women took medications for deworming, 281 (79.8%) of women took iron supplements, 309 (87.8%) of women were

aware that pregnancy needs extra energy and nutrients, 238 (67.6%) of women changed their normal dietary pattern due to pregnancy, 324 (92.0%) of women were using green leafy vegetables and sprouted grams in their diet regularly, 352 (100%) of women were taking food before consumption of family members, 310 (88.1%) of women were not fasting on any day during pregnancy, 292 (83.0%) of women were eating meat, fish and eggs in their diet regularly during pregnancy, 312 (88.6%) of women were taking fibre rich diet and fruits regularly in their diet, 320 (90.9%) of women were practising strict meal schedule, none of the women (0%) drinks coffee after meal and 324 (92.0%) of the women were washing the hands with soap after defecation.

A prior study found a strong relationship between anaemia prevention practices and women's education (Yadav *et al*., 2015). According to a study conducted in Ethiopia, drinking tea or coffee just after eating and not eating meat was linked to a higher risk of anaemia (Weldekidan *et al*., 2018). However, the fact remains that iron supplementation can prevent almost half of all cases of iron deficiency anaemia (WHO, 2015b). Pregnant women are highly advised to take iron and folic acid supplements during the first six months of their pregnancy (Noronha *et al*., 2012).

CONCLUSIONS

Anaemia is the most common health issue among pregnant women; thus, it is essential to understand anaemia and preventative measures to minimize the incidence of anaemia among them. This study demonstrates knowledge of the causes of anaemia such as repeated pregnancy at a short interval, poor dietary habits, hookworm infection and history of heavy menstrual flow among pregnant women is still poor and there was a significant relationship between the educational level of pregnant women and their knowledge of causes of anaemia. Therefore, intervention is required to reduce the prevalence of anaemia during pregnancy in this study area.

REFERENCES

Al-Mehaisen, L., Khader, Y., Al-Kuran, O., Abu Issa, F. and Amarin, Z. (2011). Maternal anaemia in rural Jordan: room for improvement. *Anaemia*. *38*, 1812.

Anitha, M. (2005). *Study to assess the knowledge and practices regarding prevention of anaemia among registered pregnant mothers attending antenatal clinics in selected hospitals of Belgaum* (Doctoral dissertation). Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore.

Bentley, M. E. and Griffiths, P. L. (2003). The burden of anaemia among women in India. European *Journal of Clinical Nutrition*. *57*(1), 52-60.

Chathurani, U., Dharshika, I., Galgamuwa, D, et al. (2012). Anaemia in pregnancy in the district of Anuradhapura, Sri Lanka needs for updating prevalence data and screening strategies. *Ceylon Medical Journal*. *57*, 101-106.

Crawley, J. (2004). Reducing the burden of anaemia in infants and young children in malaria-endemic countries of Africa: from evidence to action. *The American Journal of Tropical Medicine and Hygiene*. *71*(2_suppl), 25-34.

Hewawaduge, D., Wijesekara, J., Lekamge, K., *et al* (2019). Knowledge about iron deficiency anaemia among pregnant mothers in the first trimester in Sri Lanka. Proceeding of the 2nd Global Public Health Conference. *2*, 1-9.

Ghimire, N. and Pandey, N. (2013). Knowledge and practice of mothers regarding the prevention of anaemia during pregnancy, in a teaching hospital, Kathmandu. *Journal of Chitwan Medical College. 3*(3), 14-17.

Gowri, D., Sakthi, D. and Palanivel, C. (2017). Influence of awareness and attitude about anaemia and iron supplements on anaemic status of pregnant women attending a tertiary care centre in South India. *Journal of contraceptive studies. 2*, 1.

Gwarzo, M. Y. and Ugwa, E. A. (2013). The pattern of anaemia in northern Nigerian pregnant women. *Journal of Medicine and Medical Sciences. 4*(8), 319-323.

Hurrell, R. F. (1997). Preventing iron deficiency through food fortification. *Nutrition Reviews*. *55*(6), 210-222.

Jaseel, M. K. (2018). *Study to Assess the Incidence and Level of Knowledge about Anemia among Pregnant Women* (Doctoral dissertation). JKK Nattraja College of Pharmacy, Komarapalayam.

Kdivar, A. A., Masoum, J. S., Mohammadi, S. and Mordhi, F. (2007). Knowledge and practice of pregnant women in Fars province about intake of iron supplements. *Acta Medica Iranica. 45*(4), 301-304.

Lokare, P. O., Karanjekar, V. D., Gattani, P. L. and Kulkarni, A. P. (2012). A study of the prevalence of anaemia and sociodemographic factors associated with anaemia among pregnant women in Aurangabad city, India. *Annals of Nigerian Medicine*. *6*(1), 30.

Masukume, G., Khashan, A. S., Kenny, L. C., Baker, P. N., Nelson, G. and Scope Consortium. (2015). Risk factors and birth outcomes of anaemia in early pregnancy in a nulliparous cohort. *PloS one*. *10*(4), e0122729.

Mannar, M. V. (1999). Designing effective programmes to prevent and control iron deficiency anaemia. *South African Medical Journal. 89*(2), 23-26.

Mbule, A. M., Byaruhanga, Y. B., Kabahenda, M. and Lubowa, A. (2012). Determinants of anaemia among pregnant women in rural Uganda. *Rural and Remote Health*. *13*(2), 1-15.

Nivedita, K. and Shanthini, F. N. (2016). Knowledge, attitude and practices of pregnant women regarding anaemia, iron-rich diet and iron supplements and its impact on their haemoglobin levels. International *Journal of Reproduction, Contraception, Obstetrics and Gynecology*. *5*(2), 425-431.

Noronha, J.A., Khasawneh, E.A., Raman, S. and Seshan, V. (2012). Anaemia in pregnancy and challenges. *Journal of South Asian Federation of Obstetrics and Gynaecology*. *4*(1), 64-70.

Osborn, A.J., Muhammad, G.M., Ravishankar, S.L. and Mathew, A.C. (2021). Prevalence and correlates of anaemia among women in the reproductive age (15–49 years) in a rural area of Tamil Nadu: An exploratory study. *Journal of Education and Health Promotion*. *10*, 355.

Osungbade, K. O. and Oladunjoye, A. O. (2012). Preventive treatments of iron deficiency anaemia in pregnancy: a review of their effectiveness and implications for health system strengthening. *Journal of Pregnancy*. *2012*.

Penney, D. S. and Miller, K. G. (2008). Nutritional counselling for vegetarians during pregnancy and lactation. *Journal of Midwifery and Women's Health*. *53*(1), 37-44.

Prathapan S, Lindmark G, Fonseka P, et al. (2011). How good is the quality of antenatal care in the Colombo district of Sri Lanka in diagnosing and treating anaemia? *Qual Prim Care. 19*, 245–250.

Rahel, F. (2016). *Prevalence of Anemia among Pregnant Women Attending Antenatal Care at Selam Health Center, Addis Ababa, Ethiopia*. (Master's thesis). Department of Zoological Sciences, Addis Ababa, Ethiopia.

Rajamouli, J., Ravinder, A., Reddy, S. and Pambi, S. (2016). Study on Prevalence of Anemia among Pregnant Women attending Antenatal Clinic at Rural Health Training Centre (RHTC) and Chalmeda Anand Rao Institute of Medical Sciences Teaching Hospital, Karimnagar, Telangana, India. International *Journal of Contemporary Medical Research*. *3*(8), 2388-2391.

Rizvi F. (2012). Impact of maternal education, and socioeconomic status on maternal nutritional knowledge and practices regarding iron-rich foods and iron supplements. *The Annals of Pakistan Institute of Medical Sciences*. *8*(2), 101-105.

Scholl, T. O. (2005). Iron status during pregnancy: setting the stage for mother and

infant. The American *Journal of Clinical Nutrition. 81*(5), 1218S-1222S.

Sinawangwulan, I. P., Dewi, Y. L. R. and Wekadigunawan, C. S. P. (2018). Association between Socio-demographic, Nutrition Intake, Cultural Belief, and Incidence of Anemia in Pregnant Women in Karanganyar, Central Java. *Journal of Maternal and Child Health, 3*(2), 128-137.

Souza, A. I., Batista Filho, M. and Ferreira, L. O. (2002). Alterações hematológicas e gravidez. Revista Brasileira de Hematologia e Hemoterapia. *24*(1), 29-36.

Stephen, G., Mgongo, M., Hussein Hashim, T., Katanga, J., Stray-Pedersen, B. and Msuya, S. E. (2018). Anaemia in pregnancy: prevalence, risk factors, and adverse perinatal outcomes in Northern Tanzania. *Anaemia*. *2018*, 9.

Tadesse, S. E., Seid, O., G/Mariam, Y., Fekadu, A., Wasihun, Y., Endris, K. and Bitew, A. (2017). Determinants of anaemia among pregnant mothers attending antenatal care in Dessie town health facilities, northern central Ethiopia, unmatched case-control study. *PloS* one. *12*(3), e0173173.

Tamura, T., & Picciano, M. F. (2006). Folate and human reproduction. The American *Journal of Clinical Nutrition*. *83*(5), 993-1016.

Tay, S. C., Agboli, E., Abruquah, H. H. and Walana, W. (2013). Malaria and anaemia in pregnant and non-pregnant women of child-bearing age at the University Hospital, Kumasi, Ghana. Open *Journal of Medical Microbiology*. *3*, 193-200.

Tunkyi, K. and Moodley, J. (2016). Prevalence of anaemia in pregnancy in a regional health facility in South Africa. *South African Medical Journal. 106*(1), 101-104.

USAID. (2013). United States Agency International Development. Geneva, Switzerland: Health Report, USAID.

Weldekidan, F., Kote, M., Girma, M., Boti, N. and Gultie, T. (2018). Determinants of anaemia among pregnant women attending antenatal clinic in public health facilities at Durame Town: an unmatched case-control study. *Anaemia*, *2018*.

WHO database. (2016). World Health Organization, Global Health Observatory Data Repository/World Health Statistics. [Accessed on 28th December 2020]. Available at:https://data.worldbank.org/indicator/SH.PRG.ANEM?locations=LK-1W,

WHO. (2015a). *The global prevalence of anaemia in 2011*. World Health Organization, Geneva, Switzerland.

WHO. (2015b). *Micronutrient Deficiencies: Prevention and Control Guidelines*, World Health Organization, Geneva, Switzerland.

World Health Organization. (2012). *Guideline: Daily iron and folic acid supplementation in pregnant women*. World Health Organization.

Yadav, R.K., Swamy, M.K. and Banjade, B. (2015). Knowledge and Practice of Anemia among pregnant women attending antenatal clinic in Dr. Prabhakar Kore Hospital, Karnataka-A Cross-sectional study. *Journal of Dental and Medical Sciences. 13*(4), 74-80.